FACTORS ASSOCIATED WITH SEVERITY AND HOSPITAL ADMISSION OF MOTOR-VEHICLE INJURY CASES IN A SOUTHERN EUROPEAN URBAN AREA.

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ABSTRACT

BACKGROUND - The knowledge of injury severity as a result of motor-vehicle (MV) crashes is a key tool to identify and evaluate prevention activities. Hospital and emergency department (ED) records are a useful source of information to measure injury severity .

OBJECTIVES - To describe the main characteristics of injured people admitted to ED as a result of a MV crash, and to assess factors related to injury severity and hospital admission.

METHODS - Cross-sectional design. Subjects were MV injury patients admitted to seven EDs in Barcelona from January 1994 to June 1996. The data analyzed were obtained from the information routinely transmitted from the EDs to the Municipal Institute of Health, based on the processing of ED logs. Univariate and bivariate descriptive statistical analyses were performed, as well as multiple logistic regressions.

RESULTS - 60.7% of patients were males, 73.7% were younger than 40 years of age, while 42.2% were motorcycle and moped users and 25.2% were pedestrians. After adjusting for other variables, these three last user groups were at a higher risk of a more severe injury (OR=1.4; OR=1.5 and OR=1.7 respectively) and showed a higher likelihood of a hospital admission (OR=1.9 ; OR= 1.7 and OR= 2.1). Patients arriving at the hospital during night-time (OR=2.1) and in hospitals C or D (OR= 2.2 and OR= 2.3 respectively) were also at a higher risk of a hospital admission.

CONCLUSIONS - The study underscores that in Barcelona, pedestrians and two-wheel vehicle occupants, besides accounting for two-thirds of traffic injury cases, are also the user's subgroups with a higher risk of a more severe injury as well as a higher chance of admission. The results also point out that decision criteria on the patient need for hospitalization may vary substantially among hospitals in the case of trauma patients.

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In Europe, like most industrialized regions, motor-vehicle (MV) injuries constitute a major public health problem, both in terms of absolute numbers of victims, in terms of temporary or permanent disability, as well as because of the fact that they affect highly vulnerable population groups [Plasència, 1996] such as children [Constan, de la Revilla, Fernández et al. 1995; Carol, Arnau, Salvador 1992 ; Roberts, Campbell, Hollis et al., 1996] young people [Crutcher, Black, Campbell, 1993; Div of Unintentional Injury prevention, 1996] , and the elderly [Cortés, 1995 ; Stutts, Martell, 1992 ; Snipes, 1982]. In the last three decades, Spain, together with Portugal and Greece, ranks among the European Union countries where the negative impact of MV crashes relative to the number of registered vehicles has been highest [WHO, 1996]. In Spain, MV injuries are the primary cause of death among people aged between 15 and 24 years [Boletín Epidemiológico Semanal, 1995; Alonso, Regidor, Rodríguez et al., 1996; Espinos, Duran, Villalbí, 1989; Giné, 1992], resulting in a considerable negative influence on recent trends in life expectancy in the 1980s [Chenet, McKee, Otero et al., 1997].

Little attention has been paid until now to the fact that a large share of MV crashes take place increasingly in urban settings [Fletcher, Mc Michael, 1995]. The case of Barcelona, located in the northeastern part of the Spanish Mediterranean coast, and one of the largest urban areas in Europe (1.6 million inhabitants), has provided some insight on the public health impact of MV crashes in such setting. MV injuries account for 4.4% of Potential Years of Life Lost [Institut Municipal de Salut Pública, 1998], 10% of hospital admissions, and 8% of disablement [Seguí, Plasència, Ferrando et al., 1995] . The availability of population-based emergency department data for MV injuries occurring within the city boundaries has allowed the identification of the incidence and severity of such injuries, as well as their distribution by MV user categories [Plasència, Borrell, Antó, 1995]. A notable observation has been the striking contribution of motorcycle and moped occupants to the burden of MV injuries and disabilities [Plasència, Borrell, Antó, 1995]. The knowledge of the severity and localization of injuries resulting from MV crashes is a key element in identifying and evaluating preventive actions. Not all sources of MV crashes information collect sufficient precise and useful information to permit determination of severity [Dove, Pearson, Weston, 1986]. In general, the sources in which severity measurement is most feasible are hospital related, whether via discharges or via emergency services. However, depending on the population under study, it may be necessary to weigh up the advantages and disadvantages of each of the information sources. Thus, hospital discharge information is more precise than that from emergency departments [Seguí, Plasència, Borrell, 1996], but it must be borne in mind that it is based only on victims admitted, and is consequently subject to two limitations. On one hand, only 10% of MV crash victims attended by emergency services require hospital admission [Seguí, Plasència, Ferrando et al., 1995], and therefore we are describing a

small subgroup of the population of traffic accident victims. On the other hand, this subgroup generally involves more severe cases than those not admitted, leading to a bias in the estimation of severity towards values higher than that for the totality of MV victims.

A previous study in Barcelona demonstrated that the information collected by emergency departments is valid for monitoring trends in the magnitude and distribution of severity of injuries among victims not requiring hospitalization [Seguí, Plasència, Ferrando et al., 1995] , as measured with the Abbreviated Injury Scale (AIS) [Association for the Advancement of Automotive Medicine, 1990; Wisner, 1992; Yates, 1990; Rosman, Knuiman, Ryan, 1996; Norin, Krafft, Korner, et al., 1997; MacKenzie, 1984], and the Injury Severity Score (ISS) which is derived from it [Wisner, 1992; Yates, 1990; Rosman, Knuiman, Ryan, 1996].

A preliminary study using 1990-1991 emergency department data showed that in MV crashes occurring in Barcelona, pedestrians and motorcyclists have a higher risk of suffering a severe injury [Plasència, Borrell, Antó, 1995]. The present study is an attempt to further look at the differences in severity and risk of a hospital admission for the different user categories after taking into account demographic, injury location and environmental variables. Although the setting is the same, the data are based on information routinely collected by the emergency departments of seven Barcelona hospitals in recent years, for which a substantial reduction of the impact of injuries has been observed [Ajuntament de Barcelona, 1996].

SUBJECTS AND METHODS
SUBJECTS - For the overall description of the injured population, subjects were those individuals attended to by the emergency departments of seven Barcelona hospitals for injuries due to a MV crash from January 1994 to June 1996. Due to limitations in completeness of information for some variables, subjects for the assessment of injury severity and hospital admission risk were those individuals attended to as a result of TA injuries by four emergency departments between July 1995 and June 1996.

SOURCES OF INFORMATION - Data analyzed were transmitted from 7 emergency departments participating in the DUHAT (*Dades d'Urgències Hospitalàries per Accident de Trànsit*) project [Institut Municipal de la Salut, 1994], coordinated by the Municipal Institute of Health, and cover 90% of cases attended to by the Public Hospitals Network. This project, begun in 1994, systematically collects information on MV crash victims seen in emergency departments of the Barcelona Public Hospitals Network, including demographic and diagnostic data, as well as user type information. The remaining 10% of injury cases for which information is not available comprises cases attended to by private sources of care, which also tend to be of lower overall severity.

METHODS - For the period under study, the data based comprised 34,783 records. Cases were excluded if none of the discharge diagnoses were injuries (ICD-9-CM code less than 800.00), or if all the three possible

diagnoses were missing (14.6%). Duplicate records from the same hospital were also excluded, considering as duplicates those records having the same clinical record number, date and time of visit, and date of birth. In the absence of any personal identifier for victims, it was not possible to exclude cases seen for the same reason in different hospitals. The final data base consisted of 27,820 cases. For the assessment of the risk of severe injury and hospitalization cases provided by three of the participating hospitals had to be excluded(n=23,223) due to the presence of missing information for some variables, a consequence of the use of secondary data.

The variables transmitted from the participating centers were: hospital identification code, clinical record number, date and time of the visit, date of birth, sex, postal code of residence, type of vehicle, position of victim (driver, passenger or pedestrian), and discharge diagnoses. The coding of these diagnoses, according to ICD-9-CM criteria [WHO, 1988],was carried out either by coders within each hospital, or by coders of the Municipal Institute of Health.

Severity of the injury was measured using the computer program ICDMAP which automatically convert ICD-9-CM codes to AIS codes. This program assigns the associated AIS severity score to each ICD-9-CM diagnosis code, as well as an overall severity per patient according to the ISS, and a maximum severity for each of the following anatomical regions: head, neck, thorax, abdomen, spine, lower limbs, upper limbs, face, and external injuries. Severity was further categorized in two different ways depending on the objective. Thus, in order to describe factors associated with severity as a dependent variable, two categories were created: slight (ISS<=3) and moderate or severe (ISS>=4), while when used as an adjustment variable in the study of hospital admission, three categories were used: slight (ISS<=3), moderate (4<=ISS<=8) and severe (ISS>=9).

The variable 'admission' was created based on the coding of discharge status into two categories. Patients were considered to have been admitted if discharge status was either admission to the hospital, referral to another hospital, or death.

With regard to independent variables, the following categorizations were performed: based on date and time of the visit, the variables time of visit (morning: 6:00-14:00; afternoon/evening: 14:00-22:00; night: 22:00-6:00), and weekend (no: 7:00 Monday - 19:00 Friday evening; yes: 19:00 Friday evening - 7:00 Monday morning) were created. From anatomical regions injured, cases of multiple injuries were defined as those individuals with more than one diagnosis, and in at least two different anatomical regions. The most severe anatomical region was defined as that with the largest AIS score; when regions were tied, the most severe region was chosen using criteria employed by other authors [MacKenzie, Siegel, Shapiro et al., 1988], giving more importance to regions such as head, neck, thorax and/or abdomen. Finally, based on the variables of position and vehicle, a new variable, user type, was defined with four categories: car user, motorcycle

or moped user, pedestrian, and others (the latter included bicycle, truck and bus occupants).

Besides an overall descriptive analysis of the main study variables for the entire study period, multivariate logistic regression methods were used for the construction of models involving factors associated with severity and hospital admission. The process of model construction was done in two stages. In the first, the program constructed the model automatically, adding variables one by one using goodness-of-fit criteria, while in the second, all intermediate models were constructed manually until a final model was obtained, in order to observe the contribution of each variable, and the weight of missing values. From these models, one was chosen which involved the maximum number of variables considered *a priori* to be predictors, with the minimum number of missing values possible. All analyses were performed using the SPSS statistical package [Norusis MJ/SPSS Inc., 1993].

RESULTS

As presented in Table 1, of the 27,820 MV injury cases, 60.7% were men, and 39.3% were women. The overall mean age was 33.2 years (95% CI 33.0-33.4 years). Young people aged from 14 to 39 years were the age group with the largest contribution to all MV injuries(70.7%). In all age groups, the percentage of men was higher than that of women (over 57%), except among the elderly where the percentage was higher among women (59%).

Motorcycle and moped occupants together accounted for the largest percentage of MV injury cases (42%), followed by car occupants (30%) and pedestrians (25%). The load of two-wheel MV injuries was even higher in the 14-39 year age group (56%), while car occupant injury cases predominated in the 40-64 age group (43%), and pedestrians were the leading injured user category in the elderly (70%) and in children (67%).

About two-thirds of MV injury cases took place on week-days and in the afternoon and evening hours. Weekend injuries had a higher contribution in the population below 39 years, while night injuries were more frequent in the 14-39 age group and very low among the elderly.

About one out of every 4 cases had an injury of moderate or high severity. The relative contribution of these two severity categories was higher among children (42%) and in the elderly (36%). Almost 90% of cases had only one injury recorded, the children being the subgroup with the largest proportion of single injuries. External injuries counted for more than half of all injuries of the highest severity, followed by injuries to the spine (including whiplash), injuries to the head and injuries to lower and upper limbs. Nevertheless, this relative distribution varied substantially by age group, with a much larger contribution of head injuries among children, of spine injuries in the middle-aged population, and of lower limbs in the elderly.

Close to 8% of MV injury cases attended to in emergency departments

were finally admitted to the hospital . The proportion of admissions was higher in both extremes of the age group categories.

As shown in Table 2, bivariate comparisons indicate that males, children and the elderly, as well as pedestrians, suffered more often injuries of moderate to high severity. Injuries resulting from weekend and night crashes also were of higher severity, while injuries to the head, to the thorax and the abdomen and to both extremities were also of a higher severity. Admission proportions followed a pattern of distribution among each of the variables rather similar to the one described for severity.

Tables 3 and 4 show the results of the multivariate logistic regression models for factors associated with severity and hospital admission, respectively. Males (OR=1.3, 95% CI:1.1-1.5), multiple injury cases (OR=10.6, 95%CI:8.1-13.8), motorcycle occupants (OR=1.4,95%CI:1.1-1.8), moped occupants (OR=1.5, 95% CI: 1.2-1.9), and pedestrians (OR=1.7,95% CI:1.3-2.1) had a higher adjusted risk of suffering injuries of ISS equal or more than 4. Elderly individuals were also at higher risk of more severe injuries in comparison to the youngest group (OR=1.6, 95% CI:1.0-2.6), although this was not statistically significant.

In the case of the risk of admission, after adjusting for injury severity, males(OR=1.6, 95% CI:1.1-2.1), motorcycle users (OR=1.9, 95% CI:1.3-2.9), moped users (OR=1.7, 95% CI:1.1-2.5) and pedestrians (OR=2.1, 95% CI:1.4-3.2) had a higher independent risk of being admitted to hospital. With regard to characteristics of the visit, individuals seen during night hours had also a higher independent risk of being admitted (OR=2.1, 95% CI:1.4-2.7), as did those seen in hospitals C and D in comparison with those attended to in hospital A (OR=2.2, 95% CI:1.4-3.4, and OR=2.3, 95% CI:1.5-3.3, respectively).

DISCUSSION

This study contributes to the knowledge of the main groups of road users affected by MV crashes in a southern European urban area, and particularly to the identification of the factors associated with greater injury severity and risk of admission to hospital, based on information sources which represent a more complete coverage of the population involved than that of earlier studies [Langley, Marshall, 1994; Redmond, Barton , McQuillan et al., 1990; Bradbury, 1991] mainly based on hospital discharge data.

While age and sex patterns of MV injury distribution are overall similar to those of earlier studies in the same context [Plasència, 1996; Tomás, Asunción, 1996; Blanquer, Rapa, Melchor et al., 1993], and also similar to other countries [Langley, Marshall, 1994; Redmond, Barton, McQuillan et al., 1990; Bradbury, 1991], it is important to draw attention to the much higher relative contribution of motorcycle and moped users, and of pedestrians in comparison to other European countries and to the USA [Langley, Marshall, 1994; Bradbury, 1991; Baker, O'Neill, Ginsburg et al., 1992; Baldaccini, Biagioli, Boscolo, 1996] , and also to the higher percentage of pedestrians in comparison to other urban areas with smaller

populations [Tomás, Asunción, 1996; Blanquer, Rapa, Melchor et al., 1993] in this country. These types of users present, among themselves, different patterns of age and sex [Baker, O'Neill, Ginsburg et al., 1992]. Thus, in the present study two main subgroups must be underscored in terms of their relative contribution to the magnitude of MV injuries: young male motorcycle and moped users, and elderly pedestrians, the latter with a higher percentage of women. These results also stress that, in the case of the city of Barcelona, despite an important reduction in the overall number of MV fatalities and injuries in recent years [Ferrando, Plasència, Orós et al., 1998; Plasència, Ferrando Orós et al., 1998], age, sex and road user patterns of MV injury cases remain essentially unchanged [Plasència, Borrell, Antó, 1995] , and must continue to be considered as priority targets for local prevention policies.

Moreover, our results also point out that males, two-wheel MV riders and pedestrians have a higher risk of suffering a more severe injury, even after adjusting for other potentially related variables -such as age, sex, and type and location of the injury. These results agree with those of an earlier study in the same population [Plasència, Borrell, Antó, 1995] as well as in New Zealand [Langley, Marshall, 1994], although in the latter case, potentially confounding variables, such as age were not taken into account. It must be noted that in the case of motorcycle and moped users, in spite of the fact that in Barcelona a clearly favorable impact of the helmet law -with a substantial decrease in mortality and a lesser involvement of the head in fatal cases- has been recently documented [Ferrando, Plasència, Orós et al., 1998], two-wheel MV riders continue to be a subgroup with a higher risk of a more severe injury.

This conclusion remains true for the risk of hospital admission, since once the effects of age, sex and injury severity are controlled for, motorcycle and moped riders, together with pedestrians, show the highest risks of being admitted. On the other hand, the observation that patterns of hospital care, as measured by time of emergency department attendance and specific source of hospital care, may influence the likelihood of admission even after taking into account differences in age, gender and injury severity, deserves further attention. While a greater availability of hospital beds and/or a lesser availability of diagnostic procedures during night shifts may account for a larger chance of a hospital admission if the patient is seen at those times, no easy explanation can be provided to explain the differences among hospitals in the chance of admission. Since no differences were observed in the relative contribution of referred patients among these hospitals, greater attention must be paid to potential differences in admission criteria among them.

Although, as described above, there are advantages in using information collected by emergency departments, attention is drawn to the limitations which this involves. These limitations relate to the use of secondary data, initially collected for other purposes. This gives rise to three different situations. In the first place, data quality was not the same for all variables,

and in some cases lack of information meant the variable could not be used to describe the population. This was the case for the place of residence of the case. Earlier studies in Barcelona[Plasència, Borrell, Antó, 1995] using the same hospitals as their source of information indicated that 85% of MV injury cases were residents of the city of Barcelona. Low data quality also affected other variables associated with severity and hospital admission, mainly involving the construction of logistic regression models. Missing data in one of the factors of a case meant that the entire case would be excluded from the model. In order to overcome this limitation, an analysis was carried out of the quality of information during the initial period of the study. Quality improved throughout this period, whilst the population characteristics remained the same, and hence, in order to improve the quality of information employed for construction of the models, the period of study was restricted to the more recent year (July 1995 to June 1996). In second place, some hospitals did not collect variables important for the prediction of severity and hospital admission. This fact led to the exclusion from this part of the analysis of three of the participating hospitals. Although in the case of restricting the period of study it could be assumed that this would not modify the results, the exclusion of these hospitals could potentially have induced biases. One of the hospitals excluded was the only children's hospital in the study area, and even though the others also treated children, this hospital contributed to a high percentage of the cases. Differentiating characteristics between the child population and that of young people and adults, means that as information quality improves, better models specific to these groups will be possible in future studies. The other two hospitals excluded both handle a high volume of cases, suggesting that as a consequence our results could be biased towards lesser severity. However, when demographic characteristics and type of user of the entire study population were compared with the group chosen for the study of factors associated with severity and hospital admission, no important differences were found.

Once the analysis period and number of hospitals had been restricted, we also controlled for the effect of missing values in the construction of models. This construction was done in two phases. In the first, models were built up automatically in order to see which variables entered, complying with goodness-of-fit criteria, and in what order. In the second phase, models were constructed introducing one variable at a time in order to see the contribution of each one to the percentage of missing cases. Once all models were obtained, the one which was closest to that achieved automatically, but with the minimum possible number of missing cases, was selected.

Finally, as described in the methods section, we used the automatic conversion from ICD-9-CM to AIS codes. Although this implies that the severity assigned to injuries is minor than with the manual method [MacKenzie, 1989], we believe that this process in not inadequate when applied a large emergency department database, with a large contribution

of minor severity injuries.

This study must be considered as an attempt to pinpoint the subgroups drawing the burden of MV injuries in Barcelona, rather than an effort to explain the differences among such groups. This would certainly require information on a whole range of other important factors [Zador, Ciccone, 1993; Kraus, Riggis, Franti, 1975] not routinely collected in emergency department reports, such as speed at the time of the crash, use of protective devices such as helmets or safety belts, or presence of other acute or chronic diseases at the time of the injury.

In conclusion, the results obtained have allowed us to detect two groups of the population, namely young riders of two wheeled vehicles, and elderly pedestrians, important both in terms of the relatively high volume of cases which they represent, within the total of MV crash victims, and in terms of their higher risk of severe injury and of being admitted to hospital. For these reasons, local preventive programs should be designed with these two groups specifically in mind. Focusing on these two subgroups, rather than applying broadly unspecific injury prevention policies, should produce an important reduction in MV crash rates, as well as in the severity of injuries. Additionally, the observation of potentially differing admission criteria between the participating centers deserves a more in-depth research from a quality of care approach. This might eventually help in setting up common emergency and trauma care guidelines, which currently do not exist in Spain.

Table 1 - Distribution of the main characteristics of MV crash injury cases by age group.

AGE		1 - 13	14 - 39	40 - 64	≥ 65	TOTAL
(% cases)		3	70.7	18.6	7.7	23,618
SEX	n=	706	16,706	4,391	1,811	23,617
males		57.9	67.0	57.4	40.8	60.7
females		42.1	33.0	42.6	59.2	39.3
USER	n=	391	9,566	2,677	1,348	13,982
car occupant.		25.3	28.9	42.7	16.4	30.3
motorcycle occ.		3.8	34.3	14.3	2.2	26.4
moped occ.		0.8	21.2	5.6	1.6	15.8
pedestrian		67.5	14.3	33.7	70.3	25.2
other		2.6	1.2	3.8	9.4	2.4
WEEKEND	n=	699	16,278	4,287	1,763	23,027
no		65.1	66.2	69.7	71.9	67.2
yes		34.9	33.8	30.3	28.1	32.8
TIME	n=	654	13,962	3,676	1,503	19,795
morning		24.6	29.4	34.2	42.6	31.1
after./even.		59.5	47.7	49.0	50.0	48.1
night		15.9	22.9	16.7	7.3	20.9
MULTIPLE INJURIES n=		680	16,386	4,293	1,738	23,097
no		96.5	88.9	86.5	87.4	88.4
yes		3.5	11.1	13.5	12.6	11.6
ANATOMIC REGION n=		680	16,386	4,293	1,738	23,097
head		28.7	9.9	10.3	13.2	10.8
face/neck		1.0	1.2	1.1	1.5	1.2
thorax/abdom.		0.3	0.9	3.3	4.4	1.6
spine		2.5	14.6	21.7	4.7	14.8
lower limbs		7.6	9.3	8.4	13.7	9.5
upper limbs		5.4	8.2	7.4	9.1	8.0
external		54.4	55.9	47.8	53.5	54.1
SEVERITY	n=	675	16,272	4,264	1,715	22,926
slight		58.4	75.1	74.9	63.8	73.2
moderate		36.1	21.0	21.0	28.2	22.4
severe		5.5	3.9	4.1	7.9	4.5
ADMISSION	n=	434	16,022	4,213	1,730	22,399
yes		12.4	6.7	8.2	14.1	7.8
no		87.6	93.3	91.8	85.9	92.2

*Excluding missing values. .All differences statistically significant (p< 0.001) Anatomical region with the most severe injury.

Table 2 - Distribution by severity and admission for selected demographic, injury and health care variables. Bivariate analysis.

| | SEVERITY | | | | ADMISSION | |
	n	% slight	% moderate	% severe	n	% admitted
SEX						
males	16,311	72.0	23.4	4.6	14,661	8.3
females	10,624	74.9	20.8	4.3	8,691	6.8
AGE (years)						
0-13	675	58.4	36.1	5.5	434	12.4
14-39	16,272	75.1	21.0	3.9	16,022	6.7
40-64	4,264	74.9	21.0	4.1	4,213	8.2
65+	1,715	63.8	28.2	7.9	1,730	14.1
USER						
car occupant	4,401	78.2	14.5	7.3	4,241	6.6
motorcycle occ.	3,799	75.2	19.3	5.5	3,708	10.4
moped occ.	2,277	74.5	19.5	6.0	2,237	8.8
pedestrian	3,600	63.6	30.3	6.2	3,471	13.5
other	352	79.0	16.5	4.5	353	7.9
WEEKEND						
no	17,433	74.1	21.5	4.4	15,343	7.3
yes	8,433	71.2	23.9	4.9	7,542	8.3
TIME						
morning	6,267	74.4	20.6	4.9	6,355	5.8
after./even.	9,747	73.4	21.9	4.7	9,742	6.4
night	4,188	68.6	25.1	6.3	4,254	9.1
ANATOMIC REGION						
head	2,990	0.0	80.6	19.4	2,482	11.1
face/neck	324	83.6	14.8	1.5	283	17.0
thorax/abdom.	427	75.9	21.5	2.6	366	13.1
spine	3,871	96.7	1.1	2.2	3,377	2.7
lower limbs	2,483	25.0	57.9	17.1	2,188	28.4
upper limbs	2,188	26.1	69.6	4.3	1,824	13.4
external	14,653	96.8	3.2	0.0	12,284	2.5
MULTIPLE INJURIES						
no	23,827	77.9	19.0	3.2	20,076	7.0
yes	3,109	37.1	48.5	14.4	2,729	8.6
SEVERITY						
slight	-	-	-	-	16,605	2.4
moderate	-	-	-	-	4,957	17.8
severe	-	-	-	-	1,072	27.6

*Excluding missing values. .All differences statistically significant (p< 0.001)
Anatomical region with the most severe injury

Table 3 - Factors associated with injury severity (ISS>=4). Multivariate logistic regression model. (n= 3,973).

FACTOR	n	OR adj.	95%C.I	
AGE (years)				
1 to 13	125	-	-	-
14 to 39	2,809	0.8	0.5	1.2
40 to 64	703	0.8	0.5	1.2
65 +	336	1.6	1.0	2.6
SEX				
females	1,469	-	-	-
males	2,504	1.3	1.1	1.5
MULTIPLE INJURIES				
no	3,682	-	-	-
yes	291	10.6	8.1	13.8
USER				
car occupant.	1,240	-	-	-
motorcycle occ.	1,076	1.4	1.1	1.8
moped occ.	729	1.5	1.2	1.9
pedestrian	785	1.7	1.3	2.1
other	143	1.0	0.6	1.6
WEEKEND				
no	2,767	-	-	-
yes	1,206	1.1	0.9	1.3

* OR adjusted for all other factors.

Table 4 - Factors associated with admission to hospital.
Multivariate logistic regression model. (n= 3,970).

FACTOR	n	OR adj	95% C.I.	
AGE (years)				
1 to13	125	-	-	-
14 to 39	2,806	0.7	0.3	1.3
40 to 64	703	1.0	0.5	2.0
65 +	336	1.6	0.8	3.2
SEX				
females	1,467	-	-	-
males	2,503	1.6	1.1	2.1
USER				
car occupant.	1,239	-	-	-
motorcycle occ.	1,075	1.9	1.3	2.9
moped occ.	728	1.7	1.1	2.5
pedestrian	785	2.1	1.4	3.2
other	143	1.1	0.5	2.7
TIME				
morning	1,265	-	-	-
after./even.	1,901	1.1	0.8	1.5
night	804	2.1	1.4	2.7
SEVERITY				
slight	3,065	-	-	-
moderate	688	12.4	9.2	16.7
severe	217	20.6	13.1	32.3
HOSPITAL				
A	738	-	-	-
B	337	0.6	0.3	1.6
C	822	2.2	1.4	3.4
D	2,073	2.3	1.5	3.3

* OR adjusted for all other factors.

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